



## CORAL BLEACHING - GS III MAINS

**Q.** What do you understand by coral bleaching? Examine the reasons for coral bleaching and suggest corrective measures in this regard. (15 marks, 250 words)

**News:** *Great Barrier Reef: New mass bleaching event hits World Heritage site*

### What's in the news?

- Australia's iconic Great Barrier Reef is suffering another mass bleaching event, officials have confirmed.

### Key takeaways:

- Bleaching occurs when heat-stressed corals expel the algae that gives them life and colour.
- It is the fifth time in eight years widespread damage has been detected at the UNESCO World Heritage site.

### Coral Bleaching:

- Coral Bleaching happens when corals experience stress in their environment due to changes in temperature, pollution or high levels of ocean acidity.
- Under stressed conditions, the zooxanthellae or food-producing algae living inside coral polyps start producing reactive oxygen species, which are not beneficial to the corals.
- So, the corals expel the colour-giving zooxanthellae from their polyps, which exposes their pale white exoskeleton, giving the corals a bleached appearance.
- This also ends the symbiotic relationship that helps the corals to survive and grow.

## CORAL BLEACHING

Have you ever wondered how a coral becomes bleached?

**HEALTHY CORAL**  
1 Coral and algae depend on each other to survive.

**STRESSED CORAL**  
2 If stressed, algae leaves the coral.

**BLEACHED CORAL**  
3 Coral is left bleached and vulnerable.

**WHAT CAUSES CORAL BLEACHING?**

- Change in ocean temperature**  
Increased ocean temperature caused by climate change is the leading cause of coral bleaching.
- Runoff and pollution**  
Storm generated precipitation can rapidly dilute ocean water and runoff can carry pollutants — these can bleach near-shore corals.
- Overexposure to sunlight**  
When temperatures are high, high solar irradiance contributes to bleaching in shallow-water corals.
- Extreme low tides**  
Exposure to the air during extreme low tides can cause bleaching in shallow corals.

**NIOAA's Coral Reef Conservation Program**  
<http://coralreef.noaa.gov/>



## Causes Coral Bleaching:

- **Change in Ocean Temperature:** Increased Ocean temperature caused by climate change is the leading cause of coral bleaching.
- **Runoff and Pollution:** Storm generated precipitation can rapidly dilute ocean water and runoff can carry pollutants, which can bleach near shore corals.
- **Overexposure to Sunlight:** When temperatures are high, high solar irradiance contributes to bleaching in shallow water corals.
- **Extremely Low Tides:** Exposure to the air during extremely low tides can cause bleaching in shallow corals.
- **Ocean Acidification:** Ocean acidification makes the rise of Lysocline at which the dissolution of carbonate exceeds its formation. This led to stress and subsequent coral bleaching
- **Invasive Species:** Stress created by invasive alien species led to coral bleaching.
- **Zoonotic Diseases:** White band diseases, Black band diseases, Yellow band disease are some of the coral diseases which led to coral bleaching.

## Features of Bleached Corals:

- Corals often lose 60-90 % of their zooxanthellae as they bleach, and each zooxanthellae might lose 50-80% of its photosynthetic pigments.
- The affected corals normally restore their symbiotic algae within a few weeks or months if the stress-causing bleaching is not too severe and subsides over time.
- The coral host dies if zooxanthellae loss is sustained, i.e. if the stress persists and decreased zooxanthellae populations do not rebound.
- High temperature and irradiance stresses have been linked to the breakdown of zooxanthellae enzyme systems that protect them against oxygen toxicity.
- At temperatures exceeding 30 degrees Celsius, photosynthesis pathways in zooxanthellae are hindered, which could lead to the disassociation of the coral/algal symbiosis.
- As a result of cell adhesion malfunction, low- or high-temperature shocks cause zooxanthellae to be low.
- The detachment of cnidarian endodermal cells from their zooxanthellae, as well as the eventual expulsion of both cell types, is involved in this process.

## Initiatives taken to Protect Corals

- A number of **global initiatives** are being taken to address the issues, like:
  - a. International Coral Reef Initiative
  - b. Global Coral Reef Monitoring Network (GCRMN)
  - c. Global Coral Reef Alliance (GCRA)
  - d. The Global Coral Reef R&D Accelerator Platform.
- Similarly, the Ministry of Environment and Forests and Climate Change (MoEF&CC), India has included the studies on coral reefs under the **Coastal Zone Studies (CZS)**.



- In India, the Zoological Survey of India (ZSI), with help from Gujarat's forest department, is attempting a process to restore coral reefs using **“BIOROCK”** or **mineral accretion technology**.
- **National Coastal Mission Programme**, to protect and sustain coral reefs in the country.

## WAY FORWARD:

- Solutions for protecting the future of coral must transcend social, economic and cultural boundaries.
- Halting unplanned coastal development would play a significant role in reversing the decline of reefs in some locations.
- Promoting sustainable fishing and providing opportunities for ecotourism can help conserve corals.
- There is a need to minimise the use of chemically enhanced fertilizers, insecticides, pesticides, and herbicides which are non-degradable and harm corals.
- Harmful industrial waste must be treated before being disposed of in bodies of water.
- Water pollution should be avoided wherever possible by not dumping chemicals or oils in water bodies.
- Taking all possible measures to prevent actions that worsen global warming since Climate change is the greatest global threat to coral reef ecosystems

